3.1 Air Quality

3.1 Air Quality

3.1.1 Studies and Coordination

This section is based on the findings of the *Technical Memorandum: Air Quality Summary* (WSDOT October 4, 2001). The following discussion identifies various air quality standards, presents the results of the air quality analysis, demonstrates air quality conformity, and presents mitigation measures for temporary construction impacts. For this analysis, the project area is defined as the immediate vicinity of the proposed SR 509 and South Access Road alignments, and along the I-5 corridor from approximately South 210th Street to South 310th Street.

The U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), and Puget Sound Clean Air Agency (PSCAA) regulate air quality in the project area. Under the Clean Air Act, EPA has established the National Ambient Air Quality Standards (NAAQS), which specify maximum concentrations for carbon monoxide (CO), particulate matter less than 10 micrometers in size (PM_{10}), particulate matter less than 2.5 micrometers in size ($PM_{2.5}$), ozone, sulfur dioxide (SO_2), lead, and nitrogen dioxide. The standards applicable to transportation projects are summarized in Table 3.1-1. The 8-hour average maximum CO concentration of 9 parts per million (ppm) is the standard most likely to be exceeded because of a new transportation project. Nonconformance with the NAAQS would jeopardize funding of a transportation project. Other pollutant standards of importance in the Puget Sound region include ozone and PM_{10}.

Nonattainment areas are geographical regions where air pollutant concentrations exceed the NAAQS for one or more pollutants. Air quality maintenance areas are regions that have recently attained compliance with the NAAQS and are working to maintain that status.

The primary source of CO is vehicular traffic. Industry, wood stoves, and slash burns are also sources of CO. In urban areas, motor vehicles are often the source of more than 90 percent of the CO emissions that cause ambient levels to exceed the NAAQS (U.S. EPA 1993). The effects of CO are usually localized, occurring near congested roadways and intersections during autumn and winter, and are associated with light winds and stable atmospheric conditions. CO concentrations in most areas have been decreasing over time because of more stringent federal emissions standards for new vehicles and the gradual replacement of older, more polluting vehicles.

Ozone is a pungent-smelling, colorless gas produced in the atmosphere when nitrogen oxides (NO_X) and volatile organic compounds (VOC) chemically react under sunlight. Ozone is not emitted directly, but is formed by a reaction between sunlight, NO_X, and hydrocarbons. Ozone is primarily a product of regional vehicular traffic, point source, and fugitive emissions of ozone precursors. In the Puget Sound area, the highest ozone concentrations occur from mid-May until mid-September, when urban emissions are trapped by temperature inversions followed by intense sunlight and high temperatures. Maximum ozone levels generally occur between noon and early evening at locations several miles downwind from the sources. Ozone is a pollutant of regional interest, but is not measured at the project level.

Table 3.1-1
Summary of Ambient Air Quality Standards

Pollutant	National Primary Standards	Washington State Standards	PSCAA Regional Standards
CO			
1-Hour Average (not to be exceeded more than once per year)	35 ppm	35 ppm	35 ppm
8-Hour Average (not to be exceeded more than once per year)	9 ppm	9 ppm	9 ppm
PM_{10}			
Annual Arithmetic Mean	50 µg/m^3	50 µg/m^3	50 µg/m^3
24-Hour Average Concentration (not to be exceeded more than once per year)	150 µg/m^3	150 µg/m^3	150 µg/m^3
$PM_{2.5}$			
Annual Arithmetic Mean	15 µg/m^3	--[b]	--[b]
24-Hour Average Concentration (not to be exceeded more than once per year)[a]	65 µg/m^3	--[b]	--[b]
Total Suspended Particulates			
Annual Arithmetic Mean	--[b]	60 µg/m^3	60 µg/m^3
24-Hour Average Concentration (not to be exceeded more than once per year)	--[b]	150 µg/m^3	150 µg/m^3
Ozone			
1-Hour Average (not to be exceeded more than once per year)	0.12 ppm	0.12 ppm	0.12 ppm
8-Hour Average (not to be exceeded more than once per year)	0.08 ppm	--[b]	--[b]

[a] The $PM_{2.5}$ standard has not yet been implemented by EPA.
[b] No applicable standards.

Sources: PSCAA Regulation 1 (1994); 40 CFR Part 50 (1997); WAC Chapters 173-470, 173-474, 173-175 (1987).

Annual standards never to be exceeded, short-term standards not to be exceeded more than once per year unless noted.

ppm = parts per million
µg/m^3 = micrograms per cubic meter

Ozone is a pungent-smelling, colorless gas produced in the atmosphere when nitrogen oxides (NO_X) and volatile organic compounds (VOC) chemically react under sunlight. Ozone is not emitted directly, but is formed by a reaction between sunlight, NO_X, and hydrocarbons. Ozone is primarily a product of regional vehicular traffic, point source, and fugitive emissions of ozone precursors. In the Puget Sound area, the highest ozone concentrations occur from mid-May until mid-September, when urban emissions are trapped by temperature inversions followed by intense sunlight and high temperatures. Maximum ozone levels generally occur between noon and early evening at locations several miles downwind from the sources. Ozone is a pollutant of regional interest, but is not measured at the project level.

Particulate matter includes small particles of dust, soot, and organic matter suspended in the atmosphere. Particles less than 100 micrometers in size are measured as total suspended particulates (TSP). PM_{10} is a component of TSP and $PM_{2.5}$ is a component of PM_{10} and TSP. $PM_{2.5}$ and PM_{10} can be inhaled deeply into the lungs, potentially leading to respiratory diseases and cancer. Particulate matter may carry absorbed toxic substances, and the particle itself may be inherently toxic. Particulate matter can affect visibility, plant growth, and building materials. Sources of particulates include motor vehicles, industrial boilers, wood stoves, open burning, and dust from roads, quarries, and construction activities. Most vehicular emissions are in the $PM_{2.5}$ size range, while road and construction dust is often in the larger PM_{10} range. Most fine particulate vehicle emissions result from diesel vehicles, which release fine particulates both directly, mostly as carbon compounds, and indirectly in the form of SO_2, a gas that reacts in the atmosphere with sulfate particulates. High $PM_{2.5}$ and PM_{10} concentrations occur in autumn and winter during periods of air stagnation and high use of wood for heat. In the Puget Sound region, fireplaces and wood stoves account for almost two-thirds of winter $PM_{2.5}$ emissions (PPCAA, 1999). The project is located within the Puget Sound region which has several PM_{10} Maintenance Areas. However, the project area is outside the Duwamish and Kent PM_{10} maintenance areas, so no design modification or mitigation would be required. The EPA has not implemented $PM_{2.5}$ standards yet.

In the1970s, exceedances of the CO and ozone emissions standards prompted EPA to declare portions of the central Puget Sound region as nonattainment areas. Measures taken by EPA and local agencies since then have resulted in the achievement of attainment status. The region now is designated to be CO and ozone maintenance areas that are managed under the provisions of air quality maintenance plans (AQMP) for these pollutants. Any regionally significant transportation project in the Puget Sound air quality maintenance areas must conform to the AQMPs. Conformity is demonstrated by showing that the proposed project would not cause or contribute to any new violation of any NAAQS, would not increase the frequency or severity of any existing violation of any NAAQS, or would not delay timely attainment of the

NAAQS. The proposed project is currently considered to be within the maintenance areas for ozone and CO.

Transportation conformity is a mechanism for ensuring that transportation activities, plans, programs, and projects are reviewed and evaluated for their impacts on air quality prior to funding or approval. The intent of transportation conformity is to ensure that new projects, programs, and plans do not impede an area from meeting and maintaining air quality standards. Specifically, regional transportation plans, improvement programs, and projects may not cause or contribute to new violations, exacerbate existing violations, or interfere with the timely attainment of air quality standards or the required interim emissions reduction towards attainment. Meeting conformity requirements takes the collective participation of all jurisdictions and agencies that implement transportation projects and programs in the Puget Sound region.

CO is the most likely pollutant to exceed the NAAQS for transportation projects. Local CO concentrations from vehicle traffic were predicted for the project design year (2020). CO concentrations in 2020 were modeled for each build alternative and the No Action Alternative at three intersections within the project area—South 188th Street and SR 509, South 200th Street and SR 509, and South 200th Street and the South Access Road (collectively referred to as the modeled intersections). Impact analysis included three additional design options for the South Airport Link—H0, H2-A, and H2-B—using MOBILE5a and CAL3QHC. The modeled intersections were selected based on future traffic volume, LOS, and impacts of the proposed SR 509 freeway extension on the existing city streets or arterials. Complete modeling methods were described in the Technical Memorandum: Air Quality Summary (WSDOT October 4, 2001), which references earlier air quality analysis and documents prepared at various times as the alternatives were developed.

Because ozone is a regional pollutant, ozone concentrations from vehicle emissions resulting from the construction of the proposed project are not modeled at a local level. The PSRC models conformity to the ozone standards. The proposed SR 509: Corridor Completion/I-5/South Access Road Project is included on the 2001 to 2004 project list of the Regional Transportation Improvement Plan (TIP) that has been determined to conform to the State Implementation Plan (SIP).

Concentrations of PM_{10} during construction were estimated from EPA AP-42 emission values. EPA has not yet recommended any models or procedures to accurately measure PM_{10} concentrations along individual roadways. The project area is outside the Duwamish and Kent PM_{10} maintenance areas; consequently, no mitigation or design modification is required, though discussion of construction dust impacts is discussed later in this section.

3.1.2 Affected Environment

The evaluation of existing air quality is based on ambient air quality data collected and published by Ecology and the PSCAA. The air quality monitoring stations closest to the project area are located between 1 and 5 miles away. According to the 1997 Air Quality Report from Ecology, a CO exceedance of the NAAQS at the Puget Sound location was recorded in 1995, and an ozone exceedance was recorded in 1994. Trends for both pollutants have continued downward for the last 10 years.

3.1.3 Environmental Impacts

Long-term effects on air quality in the project area would result primarily from vehicle emissions. Air quality would meet the NAAQS at all of the modeled intersections; therefore, the alternatives would conform to the CO maintenance plan on the local level. And, even though the build alternatives are outside the Puget Sound vehicle Inspection and Maintenance (I&M) Program area, stricter vehicle emissions standards for new cars and the gradual replacement of older, more polluting vehicles with newer, cleaner cars have helped improve air quality, resulting in a reduction of the average emissions per vehicle on the road. Decreasing vehicle emissions would offset increasing emissions stemming from growing traffic volumes and slower vehicle speeds.

CO concentrations in the project area were modeled for 2020 conditions. CO emission factors consistent with the 1998 Metropolitan Transportation Plan (MTP) update were used. The latest CO emission factors developed by PSRC for 2020 in the Puget Sound region are substantially lower than those used in this study; therefore, the analysis methodology is highly conservative and was not revised to incorporate the newer PSRC emission factors. These results include 1-hour and 8-hour average CO concentrations for each alternative. Current CO readings within the project area were not modeled because the existing roadways, which are used as alternate routes, are arterials; consequently, they are not comparable to the proposed multilane and limited access SR 509 freeway extension. CO concentrations for the year of opening, 2009, are expected to be lower than the results modeled for 2020 in this analysis because traffic volumes would be less in 2009 and highly conservative emission factors were used for the 2020 analysis.

Tables 3.1-2 and 3.1-3 summarize the maximum CO concentrations projected for 2020 traffic volumes predicted at the SR 509 intersection of South 188th Street and South 200th Street, as well as the intersection of South 200th Street and the South Access Road. Modeling assumptions and the methodology used for all alternatives were consistent to allow for comparisons among the alternatives. CO concentrations under each of the build alternatives were compared to the No Action Alternative values to determine the impact of the build alternatives. Traffic operations for

Alternatives C2 and C3 would be essentially the same; therefore, they were not modeled individually.

Table 3.1-2
Maximum 1-Hour Average CO Concentrations at Modeled Intersections in 2020

Modeled Intersections	Alternative A (No Action)	Alternative B	Alternative C2 (Preliminary Preferred)	Alternative C3
South 188th Street and SR 509	7.5 ppm	10.7 ppm	10.9 ppm [a]	10.9 ppm [a]
South 200th Street and SR 509	5.4 ppm	9.2 ppm	8.3 ppm	8.3 ppm
South 200th Street and South Access Road	5.6 ppm	6.9 ppm	10.7 ppm	10.7 ppm

[a] Alternatives C2 and C3 at the South 188th Street intersection were not individually modeled because their emissions are not expected to differ substantially.
Note: The 1-hour NAAQS for CO is 35 ppm.

As shown in Table 3.1-2, CO values would not exceed the 1-hour average NAAQS for the No Action Alternative or any of the build alternatives. Table 3.1-3 shows that modeled maximum 8-hour average CO concentrations would range from 3.8 to 7.6 ppm, which are within the standard.

Table 3.1-3
Maximum 8-Hour Average CO Concentrations at Modeled Intersections in 2020

Modeled Intersections	Alternative A (No Action)	Alternative B	Alternative C2 (Preliminary Preferred)	Alternative C3
South 188th Street and SR 509	5.3 ppm	7.5 ppm	7.6 ppm [a]	7.6 ppm [a]
South 200th Street and SR 509	3.8 ppm	6.4 ppm	5.8 ppm	5.8 ppm
South 200th Street and South Access Road	3.9 ppm	4.8 ppm	7.5 ppm	7.5 ppm

[a] Alternatives C2 and C3 at the South 188th Street intersection were not individually modeled because their emissions are not expected to differ substantially.
Note: The 8-hour NAAQS for CO is 9 ppm.

CO concentrations under 2020 conditions were modeled for the South Airport Link portion of the project area. Tables 3.1-4 and 3.1-5 summarize the maximum CO concentrations projected for 2020 traffic volumes predicted at the South 188th Street and 28th Avenue South intersection and at the South Airport Link 25 feet from the travel-way (the outside lane). These results include 1-hour and 8-hour average CO concentrations under Design Options H0, H2-A, and H2-B for each alternative. The No Action Alternative was not modeled because there is currently no equivalent roadway at the location of the proposed South Access Road and South Airport Link.

Table 3.1-4
Maximum 1-Hour CO Concentrations Near the South Airport Link in 2020

Alternative/South Airport Link Design Option	South 188th Street and 28th Avenue South Intersection	South Airport Link (25 feet from travel-way)
B/H0 & B/H2-A	10.8 ppm	4.0 ppm
B/H2-B	11.4 ppm	4.2 ppm
C2/H0 & C2/H2-A	10.7 ppm	4.1 ppm
C2/H2-B	12.4 ppm	4.1 ppm
C3/H0 & C3/H2-A	10.7 ppm	4.1 ppm
C3/H2-B	12.4 ppm	4.1 ppm

Note: The 1-hour NAAQS for CO is 35 ppm.

As shown in Table 3.1-4, CO concentrations would not exceed the 1-hour average under any combination of design option and alternative. Modeled maximum 8-hour average CO concentrations values would range from 2.8 to 8.9 ppm, also falling within the standard (Table 3.1-5).

Table 3.1-5
Maximum 8-Hour CO Concentrations Near the South Airport Link in 2020

Alternative/South Airport Link Design Option	South 188th Street and 28th Avenue South Intersection	South Airport Link (25 feet from travel-way)
B/H0 & B/H2-A	7.6 ppm	2.8 ppm
B/H2-B	8.0 ppm	2.9 ppm
C2/H0 & C2/H2-A	7.5 ppm	2.9 ppm
C2/H2-B	8.9 ppm	2.9 ppm
C3/H0 & C3/H2-A	7.5 ppm	2.9 ppm
C3/H2-B	8.9 ppm	2.9 ppm

Note: The 8-hour NAAQS for CO is 9 ppm.

Alternative A (No Action)

The No Action Alternative would result in 25 to 30 percent lower 1-hour and 8-hour CO maximum concentrations than the build alternatives. Under the No Action Alternative, the maximum 8-hour average concentration predicted at South 188th Street and SR 509 would range from 5.3 to 7.5 ppm, depending on the alternative/design option.

Impacts Common to All Build Alternatives

The I-5 corridor would be improved to accommodate the flow of traffic to and from the SR 509 freeway extension. Improvements would include adding C/D lanes, auxiliary lanes and interchange ramp improvements. The I-5 corridor was not modeled because of its limited access and free-flow traffic volume; the I-5 lane additions also would occur within WSDOT right-of-way.

Alternative B

Under Alternative B, the maximum predicted 1-hour average CO concentrations would range between 6.9 and 10.7 ppm in 2020. None of the modeled intersections for the SR 509 freeway extension and the South Access Road were predicted to exceed the 1-hour NAAQS for CO of 35 ppm.

The maximum predicted 8-hour average CO concentrations would range between 4.8 and 7.5 ppm in 2020. None of the intersections were predicted to exceed the 8-hour average NAAQS for CO of 9 ppm.

Under Alternative B, South Airport Link Design Options H0 and H2-A would have 1-hour average CO concentrations of 10.8 ppm at the South 188th Street and 28th Avenue South intersection. The receptor located 25 feet from the travel-way was predicted at a maximum value of 4.0 ppm for 1-hour average CO concentrations. The 8-hour average CO concentrations were predicted to fall below the CO standard of 9 ppm at both locations as shown on Table 3.1-5.

For Design Option H2-B, 1-hour and 8-hour average CO concentrations were higher than those of Design Options H0 and H2-A. The 1-hour average CO concentrations at both locations were predicted to be well below the CO standard of 35 ppm. The 8-hour average CO concentrations were predicted to be below the CO standard of 9 ppm for both locations as shown on Table 3.1-5.

No design modifications would be required.

Alternative C2 (Preliminary Preferred)

Under Alternative C2, the maximum predicted 1-hour average CO concentrations would range between 8.3 and 10.9 ppm in 2020. None of the modeled intersections were predicted to exceed the 1-hour NAAQS of 35 ppm for CO.

The maximum predicted 8-hour average CO concentrations would range between 5.8 and 7.6 ppm in 2020. None of the modeled intersections were predicted to exceed the 8-hour average NAAQS of 9 ppm.

Under Alternative C2, Design Options H0 and H2-A were predicted to have 1-hour average CO concentrations at a maximum of 10.7 ppm at the South 188th Street and 28th Avenue South intersection. The 1-hour average CO concentrations at the receptor located 25 feet away from the travel-way were predicted at a maximum value of 4.1 ppm. The 8-hour average CO concentrations were predicted to be below the CO standard of 9 ppm at both locations.

For Design Option H2-B, 1-hour and 8-hour average CO concentrations were predicted to be 10 to 15 percent higher than the other design options. The 1-hour average CO concentrations at both locations were predicted to be well below the CO standard of 35 ppm. The 8-hour average CO concentrations were predicted to be below the CO standard of 9 ppm for both locations as shown on Table 3.1-5.

No design modifications would be required.

Alternative C3

In terms of factors affecting air quality, Alternative C3 is the same as Alternative C2, and would have identical air quality implications.

Like Alternative C2, no design modifications would be required.

3.1.4 Conformity Determination

FHWA and WSDOT projects must comply with project-level conformity criteria of the EPA Conformity Rule, and with WAC Chapter 173-420. The proposed project must be included in a conforming plan [the MTP and TIP by the regional metropolitan planning organization (MPO)]. The proposed project is included in the 2001 to 2004 Regional TIP as project WDOUM-6. Per 40 CFR Part 93. As discussed below, the proposed project must conform to the SIP by meeting several criteria.

- *The conformity determination must be based on the latest planning assumptions*. The project-level hot-spot analysis was completed using the Puget Sound Region MOBILE5a emission files used by PSRC for the MTP and TIP conformity determination at the time of the analysis. The proposed SR 509 extension and South Access Road are included in PSRC's current MTP and Regional TIP. The I-5 corridor improvements are not in the MTP and Regional TIP and would be documented in future updates prior to establishing conformity for this portion of the proposed project.

- *The conformity determination must be based on the latest emissions estimation model available*. Emissions to determine conformity to the MTP and TIP for the proposed SR 509 extension and South Access Road were calculated using MOBILE5a, the emission model used to model conformity to the Puget Sound Air Quality Maintenance Plans. The I-5 corridor improvements are not in the MTP and Regional TIP and would be documented in future updates prior to establishing conformity for this portion of the proposed project.

- *The MPO must make the conformity determination according to the consultation procedures of this rule and the implementation plan revision required by Section 51.396.* The PSRC's MTP and TIP have been determined to conform to the SIP and have been accepted by EPA for the proposed SR 509 extension and South Access Road portions of this project. The I-5 corridor improvements are not in the MTP and Regional TIP and would be documented in future updates prior to establishing conformity for this portion of the proposed project.

- *There must be a current conforming plan and a current conforming TIP at the time of project approval.* The proposed SR 509 extension and South Access Road portions of the proposed project are included in the PSRC's current MTP and Regional TIP. The I-5 corridor improvements are not in the MTP and Regional TIP and would be documented in future updates prior to establishing conformity for this portion of the proposed project.

- *The project must come from a conforming transportation plan and program.* The proposed SR 509 extension and South Access Road portions of the proposed project are included in the PSRC's MTP and TIP. The I-5 corridor improvements are not in the MTP and Regional TIP and would be documented in future updates prior to establishing conformity for this portion of the proposed project.

- *The FHWA project must not cause or contribute to any new localized CO or PM_{10} violation in CO and PM_{10} nonattainment or maintenance areas.* The proposed SR 509: Corridor Completion/I-5/South Access Road project is located in a CO maintenance area. The proposed project would not create any new violations nor contribute to the frequency or severity of any existing CO violations. CO concentration values depend on the type of facility: limited access (freeway) or signalized. Because the proposed improvements to the I-5 corridor are on a limited-access facility, they would not be anticipated to create any violations to the NAAQS for CO. The project is not located within a PM_{10} nonattainment or maintenance area.

- *The FHWA project must comply with PM_{10} control measures in the applicable implementation plan.* The project area is not within a nonattainment or maintenance area for PM_{10}; therefore, no implementation plan is required.

The proposed SR 509 freeway extension and South Access Road portions of the proposed project are included in the PSRC's current MTP and Regional TIP. The entire project has been demonstrated to meet the local project level conformity requirements. The additional I-5 corridor portion of the proposed project would need to be incorporated into the MTP and Regional TIP. The impact of the proposed project on I-5 would include the addition of north and southbound C/D lanes north of SR 516, two additional southbound lanes from SR 516 to South 272nd Street, one additional lane southbound from South 272nd Street to South 310th Street, and one additional northbound lane from South 272nd Street to SR 516. Once the I-5 corridor improvements are included in the MTP and TIP, the proposed project would meet all requirements of 40 CFR Part 93 and WAC Chapter 173-420, and it would conform to the SIP.

3.1.5 Mitigation Measures

Because no project-level exceedances of the NAAQS are predicted, no operational design modifications would be needed.

3.1.6 Construction Activity Impacts and Mitigation

Construction Activity Impacts

Particulate emissions (in the form of fugitive dust during construction activities) are regulated by the PSCAA. The operator of a source of fugitive dust shall take reasonable precautions to prevent fugitive dust from becoming airborne and shall maintain and operate the source to minimize emissions. Construction impacts would be reduced by incorporating mitigation measures into the construction specifications for the proposed project per the Associated General Contractors (AGC) of Washington guidelines (*Guide To Handling Fugitive Dust From Construction Projects).*

Mitigation Measures

Possible mitigation measures to control PM_{10}, deposition of particulate matter, and emissions of CO and NO_x during construction are as follows:

- Spray exposed soil such as slopes, subgrades, and access roads with water or other dust palliatives to reduce emissions of PM_{10} and deposition of particulate matter.

- Gravel or pave access or haul roads to reduce particulate emissions.

- Cover trucks transporting materials, wet down materials in trucks, or provide adequate freeboard (space from the top of the material to the top of the truck) to reduce PM_{10} and deposition of particulates during transportation.

- Provide wheel washers to remove particulate matter that would otherwise be carried offsite by vehicles to decrease deposition of particulate matter on area roadways.

- Remove particulate matter deposited on paved public roads to reduce mud on area roadways.

- Schedule construction trucks to avoid peak travel times to reduce secondary air quality impacts caused by a reduction in traffic speeds while waiting for construction trucks.

- Place quarry spall aprons where trucks enter public roads to reduce mud track-out.

- Require devices compliant with federal emission-control rules on all construction equipment and transportation within the construction work area powered by gasoline or diesel fuel to reduce CO and NOx emissions in vehicular exhaust. Use relatively new, well-maintained equipment to reduce CO and NOx emissions.

- Plant vegetative cover as soon as possible after grading to reduce windblown particulates in the area.

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